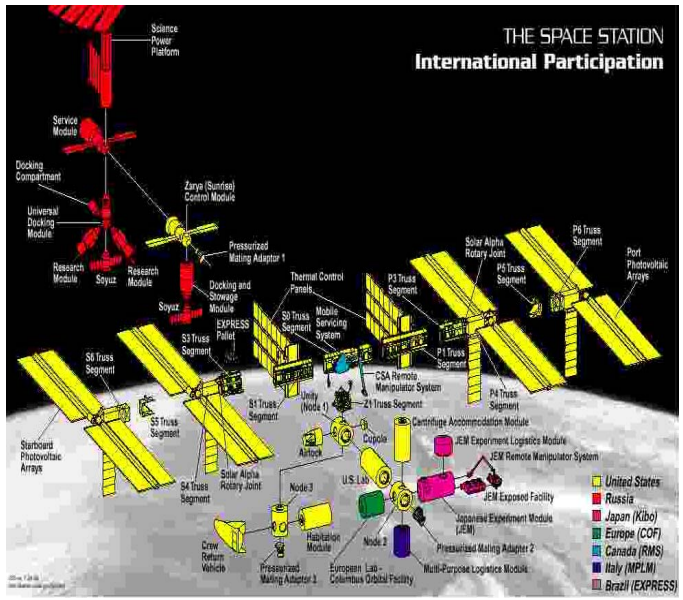
The Voice of the Customer

International Space Station Challenges

- Long Duration Missions
  - Human Factors and habitability impacts vary with time
- Living and Working
  - Different facilities and scheduling issues
- Multi-cultural crews
  - Human factors & habitability vary across cultures
- Assembly
  - Built in different countries according to different schedules
  - Assembled on-orbit



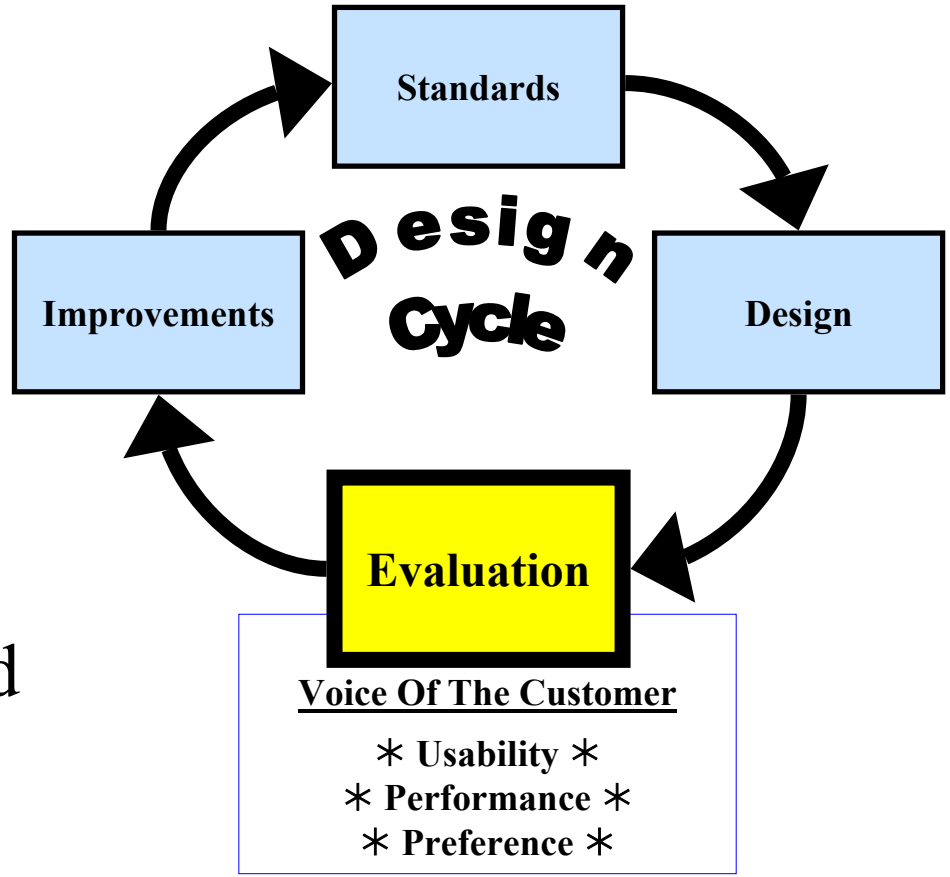
Feedback is limited until actual mission

- Move-In day is the first experience to their new home & office
  - Some hardware never seen by crew
  - Only opportunity to experience integrated ISS
- First opportunity for engineers to get feedback on the success of their designs

Expedition 3

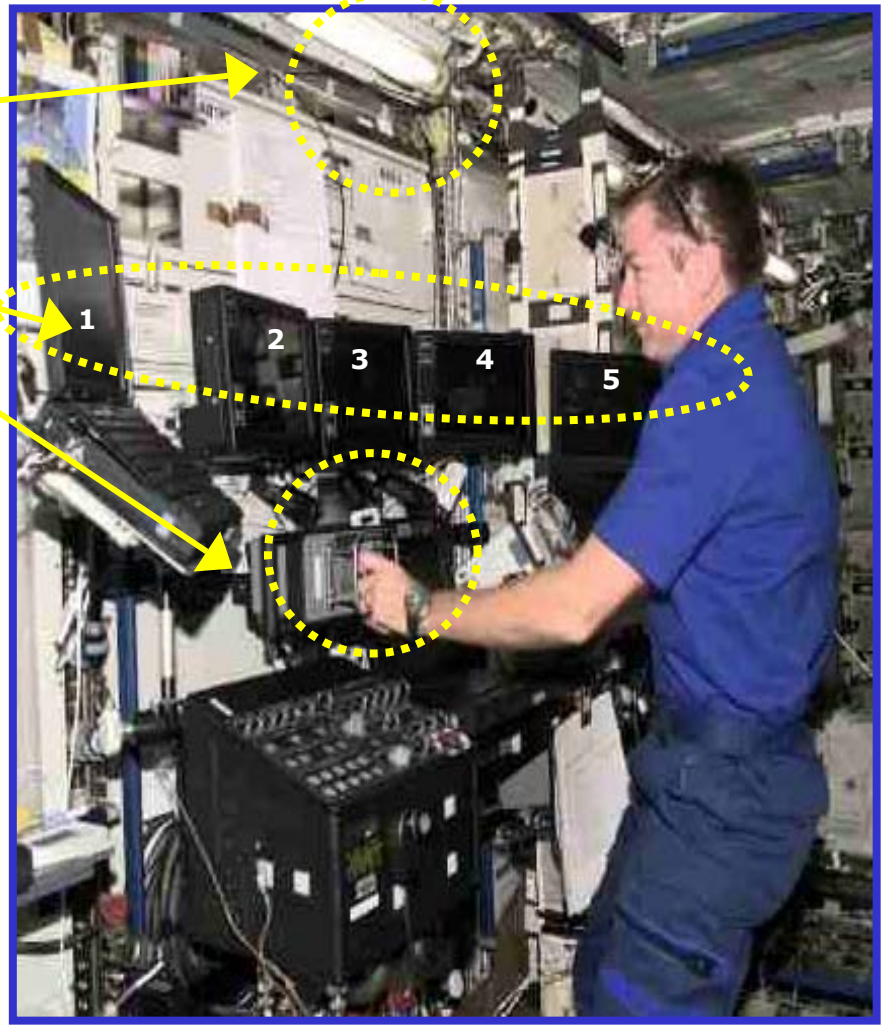
Customer feedback in the Design Cycle

- On ISS only real evaluation occurs during the actual mission
- Imperative that the feedback be captured to improve designs



ISS Human Factors Design Evaluation

- Gather user feedback on
  - Environmental Conditions
  - Operational Context
  - Equipment/Workstations
- Methods
  - Post-flight debriefs
  - In-Flight Anomaly reporting
  - In-Flight Usability Evaluation



The Voice of the Customer

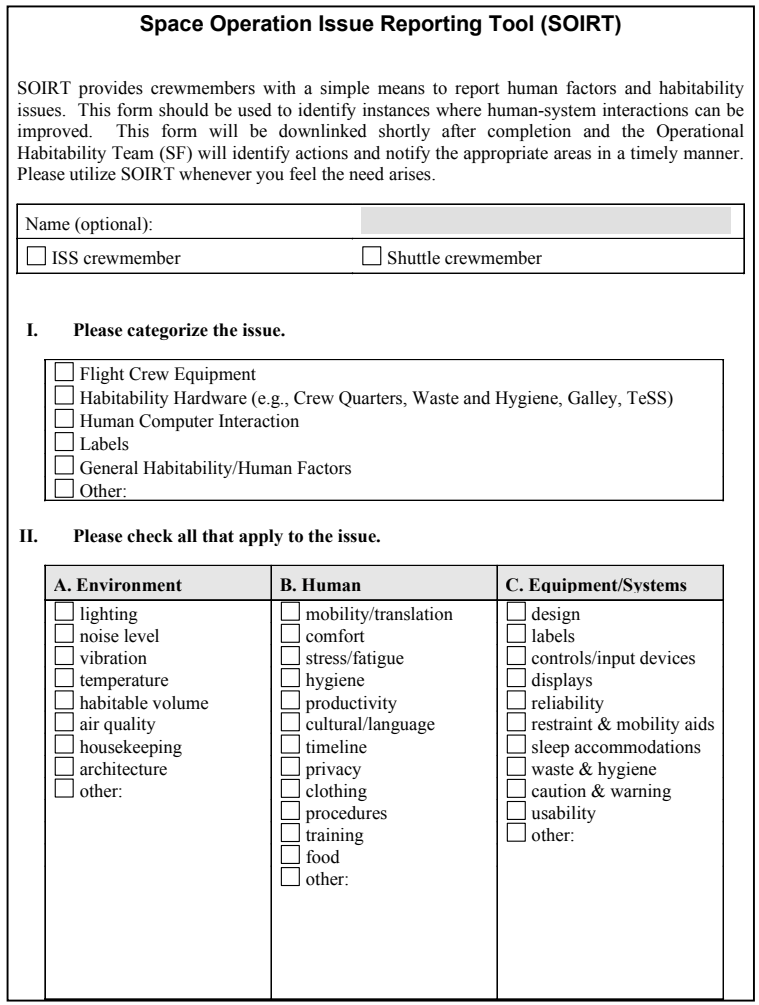
Post-Flight Debriefs

- Structured interviews with crew after the mission
  - Standardized, general questions
  - Focused mission-specific questions
  - Face-to-face communication
- Drawback
  - Poor retention recalling issues after 4-6 months on-orbit
  - Halo-effect

The Voice of the Customer

Anomaly Reports

- Real-time issue reporting
  - Crew-initiated real time reporting
  - Form includes pull-down categories and fields to help standardize responses
- Drawback
  - Passive & reactive
  - Dependant on user memory to initiate reporting



Space Operation Issue Reporting Tool (SOIRT)

SOIRT provides crewmembers with a simple means to report human factors and habitability issues. This form should be used to identify instances where human-system interactions can be improved. This form will be downlinked shortly after completion and the Operational Habitability Team (SF) will identify actions and notify the appropriate areas in a timely manner. Please utilize SOIRT whenever you feel the need arises.

Name (optional):	
☐ ISS crewmember	☐ Shuttle crewmember

I. Please categorize the issue.

- ☐ Flight Crew Equipment
- ☐ Habitability Hardware (e.g., Crew Quarters, Waste and Hygiene, Galley, TeSS)
- ☐ Human Computer Interaction
- ☐ Labels
- ☐ General Habitability/Human Factors
- ☐ Other:

II. Please check all that apply to the issue.

A. Environment	B. Human	C. Equipment/Systems
☐ lighting	☐ mobility/translation	☐ design
☐ noise level	☐ comfort	☐ labels
☐ vibration	☐ stress/fatigue	☐ controls/input devices
☐ temperature	☐ hygiene	☐ displays
☐ habitable volume	☐ productivity	☐ reliability
☐ air quality	☐ cultural/language	☐ restraint & mobility aids
☐ housekeeping	☐ timeline	☐ sleep accommodations
☐ architecture	☐ privacy	☐ waste & hygiene
☐ other:	☐ clothing	☐ caution & warning
	☐ procedures	☐ usability
	☐ training	☐ other:
	☐ food	
	☐ other:	

In-Flight Usability Tests

- In-flight usability tests
  - Focused assessment of certain workstations or operations
  - Crew performs specified tasks and completes electronic questionnaires to down link to team
- Drawback
  - Limited availability of crew time on-orbit
  - Limited control over environment

Proposed Usability Test of the Temporary Early Sleep Station

Feedback/action

- Process
  - Results from feedback analyzed for common themes
  - Potential root causes and corrective actions are identified

- Corrective actions can be:
  - New or modified requirements
  - New or modified operations
  - New or modified hardware

Conclusion

- The human user is often an after-thought in the design of a system

- Capturing the voice of the customer is a necessary step to ensuring that human factors principles and habitability considerations are folded into the forefront of future projects